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Energy Saving in Cellular Networks by Modeling the Cell Switch-off Approach as a Set Cover Problem

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Cellular networks have become the preferred mean to access the internet. This resulted in installing more base stations (cells) to cope with the explosive demand. Many cells are underutilized outside the peak traffic. A promising technique to preserve energy is to implement the Cell Switch-off (CSO) approach. CSO is commonly formulated as a Mixed Binary Linear Programming (MILP). We found that CSO is similar to the well known Set Cover Problem (SCP). In this paper we identified the similarities, and the differences, between CSO and SCP. Then we formulated the CSO as a capacitated version of the SCP after including the necessary modification. Moreover we proposed a greedy-add algorithm devised from the SCP to solve the CSO problem. Simulation results showed that our algorithm outperformed a benchmark algorithm, when the number of users is large. The two algorithms were compared in a dense small cell deployment.